the wave being in a NW.-SE. line through the center of the continental areas of the Western Hemisphere. The last traces of the area pass beyond the Pacific coast of the United States about 4 p. m. The entire area passes a given meridian in about eight hours.

(2) The principal area of low pressure.

The principal area of low pressure immediately follows the principal area of high pressure. It appears upon the eastern coast of the United States about 1 p. m., attains a maximum development in the United States at 6 p. m. (seventy-fifth meridian) with a departure of —0.040 inch, and leaves the Pacific coast between 11 p. m. and midnight, the entire area passing a given meridian in about eight hours. Over South America it attains its greatest depth of about —0.060 inch at 5 p. m. (seventy-fifth meridian). In geographic extent, at the time of greatest development, the diameter of the low area measures about 8,000 miles, being equal in area to the high pressure system. The development of low pressure is greatest over the central continental areas during July.

(3) The secondary area of high pressure.

The principal low pressure area is followed during the first half of the night by a secondary area of high pressure, feebly developed over the North American continent during July, but quite well marked over the colder southern continent. Its greatest development is attained between 10 p. m. and 11 p. m. (seventy-fifth meridian), when it covers the entire South American continent and adjacent portions of the Atlantic and Pacific oceans and the eastern portion of the United States. The maximum departure is about +0.030 inch. In geographic extent it has about one-half the area of the primary systems.

(4) The secondary area of low pressure.

The secondary area of high pressure is followed by a secondary area of low pressure. It is equal in geographic extent and in the degree of its development to the secondary area of high pressure, and is most evident about 4 a. m., when it prevails over all of South and North America, with a maximum depression of about —0.020 inch.

The position of the center of the diurnal departure of pressure depends upon the season of the year and upon the relative distribution of land and water.

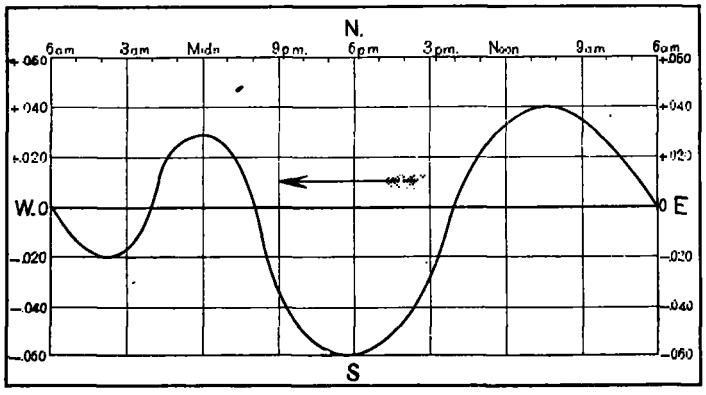


FIG. 1.

The westward propagation of the four areas is represented diagramatically in fig. 1, but is more clearly shown on Charts X–XIII, figs. 1–24.

## MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means are now reduced to standard gravity.

*Mexican data for November, 1901.*

| Stations. | Altitude. | Mean barometer.* | Temperature. | | | Relative humidity. | Precipitation. | Prevailing direction. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Max. | Min. | Mean. | | | Wind. | Cloud. |
| | *Feet.* | *Inch.* | °F. | °F. | °F. | % | *Inch.* | | |
| Chihuahua | 4,669 | 25.34 | 80.6 | 37.4 | 58.3 | 59 | ..... | e. | ..... |
| Guadalajara (Obs del. Est.) | 5,186 | 24.99 | 78.8 | 48.2 | 61.5 | 59 | 0.15 | n. | ..... |
| Guanajuato | 6,640 | 23.71 | 84.0 | 36.1 | 60.4 | 55 | 1.15 | ene. | ..... |
| Leon (Guanajuato) | 5,906 | 24.32 | 77.7 | 35.2 | 59.0 | 67 | 0.37 | nw. | ..... |
| Mazatlan | 25 | 29.91 | 88.0 | 65.8 | 75 9 | 75 | ..... | nw. | ..... |
| Merida | 50 | 30.03 | 90.5 | 52.7 | 68.4 | 77 | 0.38 | ne. | ..... |
| Mexico (Obs. Cent.) | 7,472 | 23.06 | 72.7 | 39.2 | 55.8 | 63 | 0.54 | n. | ne. |
| Monterrey (Sem.) | 1,626 | 28.30 | 93.2 | 44.6 | 64.9 | 73 | 1.32 | ne-e. | ..... |
| Morelia (Seminario) | 6,401 | 23.97 | 74.5 | 41.2 | 59.5 | 71 | 0.43 | e, | ..... |
| Puebla (Col. Cat.) | 7,125 | 23.39 | 73.4 | 42.8 | 59.2 | 69 | 1.02 | e. | ..... |
| Puebla (Col. d. Est.) | 7,118 | 23.36 | 75.2 | 37.9 | 55.8 | 65 | 1.15 | ene. | ..... |
| Queretaro | 6,070 | 24.20 | 79.7 | 37.9 | 59.7 | 63 | 1.35 | e. | ..... |
| Saltillo (Col. S. Juan) | 5,399 | 24.83 | 75.2 | 42.8 | 56.8 | 76 | 0.24 | n. | ..... |
| S. Isidro (Hac.de Gto) | ..... | ..... | 72.5 | 55.4 | ..... | ..... | 0.54 | w. | ..... |
| Toluca | 8,812 | 21.96 | 72.5 | 32.5 | 51.1 | 65 | 0.65 | n. | ..... |

*Reduced to standard temperature and gravity.

## HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

*Meteorological observations at Honolulu, November, 1901.*

The station is at 21° 18′ N., 157° 50′ W.

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

| Date. | Pressure at sea level. | Temperature. | | During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time. | | | | | | Sea-level pressures. | | Total rainfall at 9 a. m., local time. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Temperature. | | Means. | | Wind. | | Average cloudiness. | | | |
| | | Dry bulb. | Wet bulb. | Maximum. | Minimum. | Dew-point. | Relative humidity. | Prevailing direction. | Force. | | Maximum. | Minimum. | |
| | * | † | † | | | ‡ | ‡ | | | § | | | |
| 1 | 29.95 | 71 | 69 | 84 | 70 | 70.5 | 79 | se-ne. | 1 | 5 | 30.03 | 29.94 | 0.00 |
| 2 | 29.91 | 70 | 67.3 | 82 | 70 | 68.0 | 78 | nne. | 1-0 | 2 | 29.99 | 29.90 | 0.00 |
| 3 | 29.94 | 67 | 66.3 | 81 | 66 | 69.0 | 84 | sse-n. | 1 | 1-8 | 29.98 | 29.89 | 0.03 |
| 4 | 29.96 | 71 | 69 | 80 | 67 | 67.7 | 86 | n. | 1-0 | 6-1 | 30.01 | 29.98 | 0.08 |
| 5 | 29.94 | 74 | 68 | 80 | 68 | 67.3 | 77 | nne. | 1-3 | 7-3 | 30.02 | 29.93 | 0.28 |
| 6 | 29.93 | 75 | 68.5 | 81 | 72 | 66.5 | 72 | ne. | 3-5 | 7 | 29.99 | 29.89 | 0.12 |
| 7 | 29.90 | 70 | 69.3 | 80 | 71 | 66.7 | 72 | ne. | 3-5 | 6 | 29.98 | 29.90 | 0.80 |
| 8 | 29.90 | 74 | 69 | 76 | 69 | 68.5 | 86 | ene. | 4-5 | 9 | 29.94 | 29.86 | 0.78 |
| 9 | 29.95 | 75 | 69.5 | 79 | 72 | 68.0 | 77 | ne. | 5-6 | 8 | 30.00 | 29.89 | 0.41 |
| 10 | 30.00 | 76 | 70 | 77 | 74 | 67.0 | 76 | ene. | 4 | 10 | 30.04 | 29.96 | 0.37 |
| 11 | 29.98 | 74 | 71 | 79 | 73 | 68.0 | 76 | ne. | 4-6 | 10 | 30.04 | 29.95 | 0.03 |
| 12 | 29.99 | 74 | 69 | 79 | 73 | 68.7 | 77 | ne. | 5-4 | 10-3 | 30.04 | 29.97 | 0.04 |
| 13 | 30.00 | 72 | 66.5 | 78 | 73 | 68.0 | 78 | ne. | 5-4 | 8 | 30.04 | 29.95 | 0.00 |
| 14 | 30.05 | 71 | 63.5 | 77 | 72 | 65.0 | 74 | nne. | 3 | 10 | 30.06 | 29.96 | 0.27 |
| 15 | 30.07 | 73 | 64.5 | 76 | 68 | 60.7 | 65 | ne. | 5 | 9-6 | 30.13 | 30.06 | 0.01 |
| 16 | 30.04 | 74 | 65.5 | 77 | 69 | 61.7 | 65 | ne. | 5 | 4 | 30.13 | 30.03 | 0.00 |
| 17 | 30.02 | 74 | 66.5 | 77 | 71 | 63.3 | 68 | ne. | 4 | 6 | 30.07 | 29.97 | 0.03 |
| 18 | 30.04 | 72 | 68 | 78 | 73 | 64.0 | 68 | ne. | 5-4 | 4 | 30.07 | 29.99 | 0.03 |
| 19 | 30.05 | 74 | 70 | 79 | 70 | 67.0 | 78 | ene. | 3-1 | 6-3 | 30.11 | 30.01 | 0.01 |
| 20 | 30.04 | 70 | 68.5 | 80 | 70 | 69.0 | 78 | ene. | 3 | 4 | 30.09 | 29.99 | 0.00 |
| 21 | 30.01 | 67 | 65.7 | 81 | 68 | 68.3 | 83 | nne. | 1 | 1-4 | 30.07 | 29.97 | 0.00 |
| 22 | 29.99 | 72 | 68 | 80 | 66 | 66.0 | 78 | ne. | 1 | 2-6 | 30.03 | 29.94 | 0.00 |
| 23 | 30.01 | 72 | 69 | 80 | 66 | 66.7 | 75 | ne. | 2 | 6-3 | 30.05 | 29.96 | 0.02 |
| 24 | 30.01 | 74 | 68 | 79 | 70 | 66.7 | 77 | ne. | 2 | 6-3 | 30.07 | 29.98 | 0.00 |
| 25 | 29.98 | 72 | 67.5 | 79 | 72 | 64.0 | 68 | ne. | 3-2 | 3 | 30.07 | 29.96 | 0.00 |
| 26 | 29.97 | 68 | 65 | 77 | 68 | 66.3 | 79 | nne. | 1 | 6-8 | 30.02 | 29.95 | 0.01 |
| 27 | 29.90 | 69 | 66.5 | 78 | 63 | 63.3 | 74 | n. | 1 | 1-10 | 29.99 | 29.89 | 0.00 |
| 28 | 29.88 | 65 | 63.7 | 79 | 65 | 61.5 | 79 | n. | 1-0 | 2-6 | 29.95 | 29.85 | 0.02 |
| 29 | 29.90 | 66 | 65.3 | 79 | 63 | 65.3 | 83 | n. | 1-0 | 0-4 | 29.93 | 29.85 | 0.00 |
| 30 | 29.95 | 65 | 63.7 | 79 | 65 | 66.0 | 84 | w. | 1-0 | 7-0 | 29.97 | 29.87 | 0.00 |
| Sums. | ..... | ..... | ..... | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3.34 |
| Means. | 29.975 | 71.4 | 67.4 | 78.9 | 69.0 | 66.2 | 76.5 | ..... | 2.6 | 5.5 | 30.030 | 29.939 | ..... |
| Departure. | +.026 | ..... | ..... | ..... | ..... | +0.5 | +0.5 | ..... | ..... | +0.9 | ..... | ..... | ..... |

*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9)÷4. §Beaufort scale.

Mean temperature for November, 1901 (6+2+9) = 73.9; normal is 73.8. Mean pressure for November, 1901 (9+3)÷2 = 29.983; normal is 29.957.

*Rainfall data.*

| Stations. | Elevation. | Oct., 1901. | Stations. | Elevation. | Oct., 1901. |
|---|---|---|---|---|---|
| **HAWAII.** | | | MAUI—*Continued.* | *Feet.* | *Inches.* |
| HILO, e. and ne. | *Feet.* | *Inches.* | Haleakala Ranch, n | 2,000 | 0.65 |
| Waiakea | 50 | 11.60 | Wailuku | 200 | 0.42 |
| Hilo (town) | 100 | 9.51 | LANAI. | | |
| Kaumana | 1,250 | 15.99 | Keomuku, e | 6 | |
| Pepeekeo | 100 | 9.03 | OAHU. | | |
| Hakalau | 300 | | Punahou (W. B), sw | 47 | 4.14 |
| Honohina | 300 | | Kulaokahua, sw | 50 | 3.56 |
| Laupahoehoe | 500 | | Makiki Reservoir | 120 | 3.84 |
| Ookala | 400 | 5.94 | Kewalo (King street), sw | 15 | 3.77 |
| HAMAKUA, ne | | | U. S. Naval Station, sw | 6 | 2.92 |
| Kukaiau | 250 | 4.90 | Kapiolani Park, sw | 10 | 3.02 |
| Paauilo | 750 | | Manoa (Woodlawn Dairy), c | 285 | 8.20 |
| Paauhau Mill (Gibb) | 300 | 2.73 | School street (Bishop), sw | 50 | |
| Paauhau (Greig) | 1,150 | | Pacific Heights, sw | 700 | 4.94 |
| Honokaa (Muir) | 425 | 2.56 | Insane Asylum, sw | 30 | 3.08 |
| Honokaa (Rickard) | 1,900 | | Kalihi-uka | 260 | |
| Kukuihaele | 700 | 2.72 | Kamehameha School | 75 | |
| KOHALA, n. | | | Nuuanu (W. W. Hall), sw | 50 | 3.66 |
| Awini Ranch | 1,100 | | Nuuanu (Wyllie street), sw | 250 | |
| Niulii | 200 | 4.44 | Nuuanu (Elec. Station), sw | 405 | 5.80 |
| Kohala (Mission) | 521 | 3.54 | Nuuanu (Luakaha) c | 850 | 10.76 |
| Kohala (Sugar Co.) | 235 | 4.72 | Waimanalo, ne | 25 | 2.14 |
| Hawi | 300 | | Maunawili, ne | 300 | 4.17 |
| Hawi Mill | 600 | | Kaneohe, ne | 100 | |
| Waimea, c | 2,720 | 0.70 | Ahuimanu, ne | 350 | 6.53 |
| KONA, W. | | | Kahuku, n | 25 | 1.47 |
| Kailua | 930 | 2.72 | Waialua, n | 20 | 1.60 |
| Holualoa | 1,350 | 2.54 | Wahiawa, c | 900 | 2.68 |
| Kealakekua | 1,580 | 3.64 | Ewa Plantation, s | 60 | 3.85 |
| Napoopoo | 25 | | Waipahu, s | 200 | 4.64 |
| KAU, se. | | | Moanalua, sw | 15 | 4.47 |
| Kahuku Ranch | 1,680 | 10.00 | KAUAI. | | |
| Honuapo | 15 | 4.59 | Lihue (Grove Farm), e | 200 | 10.20 |
| Naalehu | 650 | 7.78 | Lihue (Molokoa), e | 300 | 11.90 |
| Hilea | 310 | 9.10 | Lihue (Kukaua), e | 1,000 | 14.28 |
| Pahala | 850 | 5.54 | Kealia, e | 15 | 8.16 |
| Moaula | 1,700 | 15.41 | Kilauea, ne | 325 | 5.79 |
| PUNA, e | | | Hanalei, n | 10 | 7.87 |
| Volcano House | 4,000 | 6.66 | Waiawa, sw | 32 | 0.05 |
| Olaa | 1,700 | 13.08 | Eleele, s | 200 | 1.24 |
| Olaa | | | Waiawa, Mountain, s | 2,100 | 16.14 |
| Kapoho | 110 | | McBryde (Residence) | 850 | 4.66 |
| Kalapana, se | 8 | | Lawai | 450 | 6.98 |
| MAUI. | | | | | |
| Lahaina | | | Too late for last report— | | |
| Waiopae Ranch | 700 | 1.99 | Kahuku Ranch | | 2.41 |
| Kaupo (Mokulau), s | 285 | 5.17 | Kailua | | 4.98 |
| Kipahulu, s | 300 | 4.86 | Waiopae | | 0.44 |
| Kahikinui | 1,550 | | Haleakala Ranch | | 0.98 |
| Hamoa Plantation, se | 60 | 2.98 | Laupahoehoe | | 1.97 |
| Nahiku (Anderson), ne | 60 | 5.69 | Hakalau | | 5.31 |
| Nahiku, (Nishwitz), ne | 800 | 10.39 | Honohina | | 4.08 |
| Haiku, n | 700 | 4.28 | Eleele | | 0.48 |
| Kula (Erehwon), n | 4,500 | 0.17 | McBryde | | 1.90 |
| Kula (Waiakoa) | 2,700 | 0.01 | Puuomalei | | 0.82 |
| Puuomalei, n | 1,400 | 3.22 | Hawi Mill | | 0.77 |
| Paia, n | 180 | 1.03 | | | |

GENERAL SUMMARY FOR OCTOBER, 1901.

Temperature mean for the month, 75.8°; normal, 76.3°; average daily maximum, 81.9°; average daily minimum, 70.5°; average daily range, 11.4°; greatest daily range, 17°; least daily range, 5°; highest temperature, 84°; lowest, 66°.

Barometer average, 29.950; normal, 29.966; highest, 30.06; lowest, 29.81; greatest 24-hour change, .10. Lows passed this point on the 1st, 10th, and 23d; highs, on the 7th, 19th, and 28th. It will be interesting to note whether seven successive months of low barometer will be followed by unusually heavy rains.

Relative humidity, 76.0 per cent; normal, 72.5; mean dew-point, 67.8; normal, 66.1; mean absolute moisture, 7.45 grains to the cubic foot; normal, 7.06.

Rainfall, 4.14 inches; normal, 2.46; rain record days, 22; normal, 19; greatest rainfall in one day, 2.79, on the 2d; total at Luakaha, 10.76; at Kapiolani Park, 3.12. Total rainfall since January 1, 28.96; normal, 27.24.

The artesian well water stands at 33.12 feet above mean sea level. At the same date in 1900 it stood at 33.19. The average daily mean sea level for October was 10.37 feet on the scale; 10.00 representing an assumed annual mean, and 9.82 the actual annual mean for nine years previous to 1901.

Trade wind days, 24 (8 of north-northeast), normal, 22; average force (during daylight) Beaufort scale, 2.3. Cloudiness, tenths of sky, 4.7; normal, 4.3.

Approximate percentages of district rainfall as compared with normal: Hilo, 90 per cent; Hamakua, 75; Kohala, 120; Waimea, 23; Kona, 64; Kau, 375; Puna, 100; Maui, varying all the way from 10 to 100; Oahu, 80 to 175; South Kauai, 300; North Kauai, 120. The drought in North Hawaii, viz, in Hamakua and Kohala, was broken by rains setting in on the 21st. Later indications are of varying winds and abundant rain. Hilea, Kau, had 7.50 inches in twenty-four hours, ending 31st; other Kau stations nearly as much.

Mean temperatures: Pepeekeo, Hilo district, 100 feet elevation, average maximum, 80.1°; average minimum, 69.9°; Waimea, Hawaii, 2,730 elevation, 77.6° and 65.4°; Kohala, 521 feet elevation, 81.5° and 70.7°; Walakoa, Kula, Maui, 2,700 elevation, 81.3° and 60.6°; Kulaokahua, W. R. Castle's 60 feet elevation, highest, 88°; lowest, 67.5°; mean, 75.7°; Ewa Mill, 50 feet elevation, average maximum 85.6°; average minimum, 68.6°; probable mean, 76.4°.

The principal event of the month was the setting in of rains on the 21st on Hawaii Island. The storm of the 3d was singularly confined to Kauai and Oahu. A heavy swell set in on windward coasts at the end of the month. Slight snow fell on Mauna Kea on the 29th. Light earthquake was felt at Kohala, 3 a. m. 15th. Thunder and lightning accompanied by heavy rains on Maui on the 30th.

NOTE.—In view of the remark made in the above report as to continuous low barometer and probable sequel, it may be interesting to know that torrential rains were falling on the island of Hawaii before that report appeared in print. Twenty-five inches in forty-eight hours are officially reported from Hilo[1], and verbal report gives 30 inches in two days at Olaa.

## CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. Maxwell Hall, the following data are offered to the MONTHLY WEATHER REVIEW in advance of the publication of the regular monthly weather report for Jamaica:

*Jamaica, W. I., climatological data, October,* 1901.

| | Negril Point Lighthouse. | Morant Point Lighthouse. |
|---|---|---|
| Latitude (north) | 18° 15′ | 17° 55′ |
| Longitude (west) | 78° 23′ | 76° 10′ |
| Elevation (feet) | 33 | 8 |
| Mean barometer 7 a. m. | 29.857 | 29.844 |
| Mean barometer 3 p. m. | 29.975 | 29.788 |
| Mean temperature 7 a. m | 79.9 | |
| Mean temperature 3 p. m | 84.3 | |
| Mean of maxima | 87.0 | |
| Mean of minima | 74.2 | |
| Highest maximum | 89.0 | |
| Lowest minimum | 71.0 | |
| Mean dew-point 7 a. m | 74.3 | |
| Mean dew-point 3 p. m | 73.8 | |
| Mean relative humidity 7 a. m. | 83.0 | |
| Mean relative humidity 3 p. m. | 71.0 | |
| Total rainfall (inches) | 3.44 | 9.15 |
| Average wind direction 7 a. m | nne. | n. |
| Average wind direction 3 p. m | nne. | nne. |
| Average hourly velocity, miles 7 a. m | 6.2 | 5.9 |
| Average hourly velocity, miles 3 p. m | 10.6 | 9.9 |
| Average cloudiness (tenths): | | |
| 7 a. m. Lower clouds | 0.3 | 1.4 |
| 7 a. m. Middle clouds | 2.4 | 1.4 |
| 7 a. m. Upper clouds | 2.7 | 1.0 |
| 3 p. m. Lower clouds | 0.6 | 1.8 |
| 3 p. m. Middle clouds | 5.5 | 2.1 |
| 3 p. m. Upper clouds | 0.7 | 1.1 |

NOTE.—The pressures are reduced to standard temperature and gravity, to the Kew standard, and to mean sea level. The thermometers are exposed in Stevenson screens.

[1] November 8–9.